Field (A. G.)

ANNUAL ADDRESS

DELIVERED AT THE

Twentieth Annual Meeting

OF THE

IOWA STATE MEDICAL SOCIETY,

HELD IN THE

CITY OF DES MOINES, JUNE 26 AND 27, 1872.

BY

Box 3

A. G. FIELD, M. D.,
PRESIDENT.

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THE PRESENT ATTITUDE OF MEDICAL SCIENCE.

GENTLEMEN.—With no pretensions to what is essentially new,* I crave your indulgence while I shall attempt, briefly, some expositions of THE PRESENT ATTITUDE OF MEDICAL SCIENCE.

One of the striking characteristics of the present age is found in the extent and variety of new discoveries, and the rapidity with which they are converted into benefits to mankind. With every advancing step in intellectual development, do the several branches of scientific study and of artistic skill advance in a geometrical ratio. At no previous time in the history of the world has there been such vigorous brain work, such zealous enthusiasm, and such grand achievement in developing new resources to shorten the process of production, to economize natural forces, and to increase the wealth of nations. Progress pertains alike to the mechanical arts and to physical and metaphysical sciences. It pertains especially to *practical medicine*, to every branch of it — anatomy, physiology, histology, pathology, therapeutics, hygiene, etc., and in the widening channels of its sphere of usefulness there has been found occasion for the institution of new branches of scientific inquiry. Even the most recent of these have by successive contributions rapidly developed from meager or hypothetical beginnings, into systems, embodying enough of demonstrable truth to be entitled to some rank in the scale of exactness. Medicine is not only *pro*gressive, but it is somewhat *ag*gressive; nearly the whole list of the natural sciences being now laid under for contribu-

*The author desires to make a general acknowledgement of his indebtedness to the several sources of information from which the substance of this address has been derived.

tions. Many newly discovered facts and principles, bubbling up along their rippling currents, have been appropriated to contribute to the longevity, health, and happiness of mankind. This advancement, and these acquisitions, have supplanted all mere speculative theories, and have established a scientific basis for all future progress and development. The present demand is for demonstrative proof, and no theory is worth anything, that is not sustained by positive evidences. The medical student, instead of wasting his time in a fruitless effort to comprehend abstruse doctrinal propositions, devotes himself to a careful study of the *real* man, his composition, vital and physical, and the phenomena of health as exhibited in normal organization and functions; and having familiarized himself with these, he is brought face to face with disease, in clinics and the well filled wards of hospitals, where he observes for himself the modifications of structure, and the perversion of functions with which it will be his future mission to deal.

In the *laboratory* he becomes familiar with the evaporating dish, and the test tube; and in the *dead room*, with the scalpel in his own hand, and the microscope under his own eye, he is permitted to trace and to study the very footprints of primary lesion. It is thus that he learns the significance of the language of nature as expressed in the rational and physical signs of disease. He is enabled to interpret a hitherto mystical tongue, the new tones of which, are uttered with every new phase of disease to admonish and to direct in the selection and use of the means of cure. But with the completion of the college course, the medical student has but entered the portals of the temple. He is but little more than qualified to prosecute advantageously the real curriculum, the syllabus only of which he has as yet scanned. For the field of study upon which he has entered is as varied as it is limitless; it is as broad as the universe. All the processes of the animal economy, and all of the phenomena of multifarious types of molecular, as well as of organic life, degeneration and death, are embraced within the scope. It is his province to trace from "shapeless clod to crystal, from crystal to plant, from plant to animal, and from brutal life to man," the varying gradations in the operation of the same harmonious laws that preside supreme over

> "Each as parts of one stupendous whole,
> Whose body nature is, and God the soul."

It is his province to examine questions pertaining to the ultimate nature of matter, of spirit, and of mind; and to scrutinize, if he cannot solve, the intricate problems involved in this trinity; for it is to arrest the mutations which affect the integrity of these unions, that he devotes his best energies.

The striking and beautiful analogies presented in the mode of reproduction, and in the ultimate structure of vegetable and animal organization, were until recently unknown. The announcement, first made by M. Pouchet, that animal life is in all instances derived from the

ova, has been sustained and fortified by the researches of Bischoff, Rasciboski, M. Costa, and by Dalton; and that there is at least a striking physical resemblance between the ultimate germinal vesicle in the seed of the plant and in the ova of the animal, there seems to be no longer occasion to doubt. Schliden was first to discover that the ultimate structure of all plants was cellular, which fact having been generally conceded, prepared the way for the researches of Schwan, resulting in the further discovery that all tissues of animals were also made up of cells, with a variable amount of interstitial or intercellular substance in each — bone, muscle, tendon, integument, etc. We are therefore led to the contemplation of individual life, as the sum of the ultimate cell lives of which in turn it is composed. The aggregated histories, therefore, of the successive development, maturity and decay of the ultimate cells in an individual, embody all the phenomena of individual life. The ultimate germinal vesicle, under the direction of vital force becomes an aggregation of cells, which multiply with growth, and diminish with decay. A normal proportion of healthy cells gives the health phenomena to the action of organs, and healthy organic life, duly balanced, gives health to the individual. Thus are established, broad and rational, fundamental principles in physiology, pathology, and therapeutics. The phenomena of healthy cell motion open to the physiologist the most delightful fields of inquiry, and the perverted conditions of ultimate cells unfold to the pathologist equally as wide a range for investigation and study. To the understanding of the intelligent physician, the one process is not more a natural process than the other, both proceeding from, and being regulated by, recognized natural laws. But the empirical ideal of disease is that it is a foreign and unnatural element, seizing upon and antagonizing natural processes, which can be protected only by driving out from the body, the enemy of life, by remedial agencies.

Organic Chemistry, is slowly but surely turning the leaves of a hitherto unknown book. In all of the processes and products of life, as well as of disease and death, it is removing obscurities as by the touch of magic. As illustrations, may be mentioned the results of the comparative analysis of blood in large vessels, and the very satisfactory knowledge we now have of the processes in digestion, obtained by means of the artificial gastric fistula. It has been shown that only nitrogenous substances, albumen, fibrine, caseine, etc., are acted upon and digested in the stomach — the amylacious and fatty passing on to the duodenum, to be acted upon by the bile and pancreatic juice; the former being converted into dextrine and sugar, the latter, from emulsion into glycerine and fatty acid, to enter the circulation.

The relation, of the several kinds of food to the several vegetable and animal functions of the human body, has been more than conjectured. To Baron Leibig is justly due the credit of directing atten-

tion to nitrogenous food as the source of muscular force, and to amylaceous and fatty food as the source of animal heat and fat; as well as to the amount of urea and of phosphoric acid excreted, as the measure of labor, muscular or mental, performed.

The heart was formerly regarded as the generator of animal heat, and to have in health a very high temperature. But the doctrine of *innate heat*, which ruled in medicine for fifteen hundred years from the time of Hypocrates and Galen, was refuted by Lavoisier, who discovered that the heat of the body was in proportion to the amount of carbon consumed by the oxygen of respiration, and who believed the combustion to occur in the substance of the lungs. Leibig, advancing another step, located the combustive process in the substance of muscles. But the views of Leibig, so generally adopted, were doomed to considerable modification from the experiments of Dr. Mayer, and also of Dr. Heaton, as published in the *Philosophical Magazine* for May, 1867. These confirmed the views of Leibig, in that food is force producing in proportion to the amount of carbonic acid and water eliminated in its combustion, or in other words, urea (C 2, H 4, N 2, O 2), but showing that the blood is really the medium in which the combustion occurs, hence the seat of animal heat and force. Thus therefore, in the progress of scientific physiological discoveries, are we conducted back (as in geological chronology,) to the law of Moses, which taught that the blood contained the life of the animal. The equivalent of animal heat reduced to expressions of mechanical force, has been shown in a paper by Samuel Houghton, and published in the Smithsonian Report for 1870. Dr. Edward Smith estimated from experiments the amount of carbon daily excreted by a healthy individual to be from six to eight ounces, or two grains of urea for each pound of body weight, which reduced to expressions of force in body movement, gives six miles, or one hundred and fifty foot-tons, as the equivalent of body heat daily employed in vital work. In muscular labor the amount of urea daily excreted is more than five hundred grains, which represents a force equivalent in body movement to more than twenty miles, or more than seven hundred foot-tons. Dr. Frankland, by experiments, as published in the *Scientific American* in 1869, found that the calorific value of various articles consumed in the human body, corresponded to the mechanical force represented by the combustion of the same in oxygen. For instance, the heat or energy evolved in the combustion of ten grains of butter in oxygen, he found to be equivalent to fourteen thousand three hundred and fifty-seven pounds lifted through one foot; exactly the force generated in its oxidation in the human body whereby it is converted into urea, carbonic acid and water. Corresponding results were obtained in experiments with flour, rice, beef, potatoes, milk, eggs, etc.

In febrile diseases, like typhus, in which the body heat exceeds the normal amount one-tenth or one-eighth, consequent upon the increased metamorphoses of tissue caused by the disease poison, the rationale

of a nutritious diet is found in the supply of the materials of combustion from without the body; while in the condition known as collapse, body combustion being measurably suspended, food cannot be appropriated, but artificial heat must be supplied from extraneous sources. A well known author, of high repute, has used the following language:

"The most elevated problems of human intellect, the discovery of the laws of vitality, cannot be resolved without an accurate knowledge of chemical forces. Even the rhythm of the heart is not specially endowed, but is in obedience to laws which extend throughout the natural world."

Vital force he holds to be but one modification of the universal force which exhibits itself in all nature, both animate and inanimate.

Heat, light, and electricity can no longer be confidently regarded as separate and independent agencies. Huxley, Spencer, Descartes, Rumford, Faraday, Helmholtz, Leibig, and Yeomans, have all disturbed their supposed stability as such, and have adduced strong evidence that tends to indicate their ultimate identity. And Herbert Spencer, with the support of such authority as Draper and W. B. Carpenter, follows the principle into organic life, and even the human understanding. In a paper recently presented to the British Association by Dr. T. Dickson, the third proposition is thus stated:

"This force (vital) is convertible into, and correlative with the other physical forces, because vitality is directly convertible into heat and electricity."

Dr. W. B. Richardson, before the same Society, in a paper entitled "Caloric the Form of Force in Nervous Matter," uses the following language: "In so far, then, as motion represents life, caloric is the source of living motion. It may undergo modification in character, and be named 'electrical force,' 'galvanic force,' etc., but it is the Alpha and Omega of them all, *the principle of motion.*"

The subject of METEOROLOGICAL CHEMISTRY, has, within a comparatively recent period, received attention. Much yet remains to be done in perfecting means and apparatus for the thorough elucidation of this subject; but it has been made evident that the quantitive proportion of the ingredients of atmospheric air is subject to considerable variation, which may be recognized by chemical analysis. The atmospheric element known as ozone, of such great sanitary value, Professor Maulegazza has shown by experiments reported to the Institute of Lombardy, may be produced from the essences of cherry, laurel, cloves, lavender, mint, etc. Phosphorus, as an ingredient of atmospheric air, was shown by Frankland, in 1871, to be absolutely indispensable in the prolonged support of animal life, and that microscopic germs did not develop in media, freed from phosphorus. Mayer and Lehman also found that cellules would not develop from albumenoid substances, independent of phosphoric influences. In the annual report of the board of health for the State of Massachusetts, in 1871, are published some of the researches of Dr. Angus Smith, as inspector

under the "alkaline act" of England, which clearly indicate that the subject is intimately connected with sanitary and medical science. Regnault and Desaushure confined their observations to the quantitive proportions of oxygen and of carbonic acid, but more recently the relative proportions of ammonia, of hydrochloric, and of sulphuric acids have been found to be equally valuable. Mr. A. H. Pearsons, Ass. in Chem. Lab. Mass, Institute Technology, found by experiments, in the spring of 1870, that the amount of carbonic acid varied from 257 to 500 in a million parts of atmosphere in the city of Boston. In the air of forty school-houses examined, the amount of carbonic acid varied from 773 to 1992 parts in a million. In different localities in the city of London, the variation in the quantities of carbonic acid was 520 in a million parts of atmosphere. Free ammonia is found to range in quantity from 22 to 146; hydrochloric acid from 100 to 900; and sulphuric acid from 100 to 15000. In the breath of persons with catarrh, measles and diptheria, the quantity of ammonia, which in health is uniform, was diminished. The proportion of organic matter in the breath of persons suffering from Bright's disease, was found to be unusually large, while it was in chlorosis less than in health. As the atmospheric air is the great reservoir into which escape most of the products of change in the more solid forms of matter, as well as the source from which are supplied most of the demands of organic life, and as the varying peculiarities of its constitution must be felt by the animal body to which it supplies food either good or bad, it is evident that this branch of study has claims upon the attention of every intelligent practitioner of medicine.

The Microscope, is now brought into requisition in the prosecution of nearly every branch of medical study. In the pathology of parasitic and of zymotic diseases especially, it has inaugurated a new era. The elaborate experiments of Dr. Angus Smith have been repeated with verifying results in France, Germany and America. The concurrent testimony is, that there is no such thing as absolutely pure air or pure water in a natural state in any locality; that both of these substances teem with infinite varieties of organisms, both animal and vegetable. In the air of rooms during crowded meetings there are found fibres and epithelial scales, nucleated cells, cells surrounded by granular matter, and separate cellules; and in the purest atmospheric air are found ova and spores, sporules and fungi, in infinite variety, that enter our bodies with food, and with the air we breathe, traverse the smallest capillaries of the densest tissues, live, propagate and die, many of them without producing any perceptible effect; others are believed to be poisonous, and to be largely if not wholly concerned in causing the various phenomena of infectious, contagious and zymotic diseases, as the several results of so many distinct kinds of poisons. M. Bechamp has also shown that microzymæ pervade organic tissues in a healthy condition, and he has been sustained by no less authority than M. De Mouchy, in the assertion that they are the agencies in

certain physiological functions, as the production of *salivary diastase*, by a kind of fermentation peculiar to them. He has further maintained that they are the constant and normal occupants of the hepatic cells, and that they are concerned in the ultimate process of glycogeneses. These oscillating granules in ultimate cells of other tissues, he regards as active agencies also in other processes whereby tissues are formed and repaired. Equally interesting have been the researches relative to the *morbid* processes due to microscopic organisms. Helmholtz, himself a victim of hay fever, discovered vibrinœ in the characteristic secretion. Assuming the disease to be the effect of these organisms and remembering that Binz had found a solution of quinine poisonous to all infusoria, he injected a solution of this alkaloid into his nostrils which after a few repetitions resulted in complete recovery. Dr. G. J. Richardson, of Cold Spring, New York, after ingesting decomposing beef tea, found uniformly in several repetitions of the experiment, a peculiar kind of microscopic animalcula in specimens of his own blood. From these he experienced no inconvenience and concludes therefore that some kinds of these organisms are inert, while he believes others to be the elementary principles of infection and contagion. The published observations of Dr. Salsbury are too well known to bear repetition. They have, it is claimed, been verified by Drs. C. H. Perkins, F. H. Davis, and by M. P. Bolistra. By the latter ague poison is defined as granular microphites, in form resembling the *cactus peruvianus*, around which cluster small green spores and also vessels containing spores.

Similar experiments by Frankland, by M. Pouchet, by M. Chaveau, by Edwin Klebes, by Letzerick and others, have resulted in their claims to the discovery of either animal or vegetable microscopic organisms, as the morbific agent in measles, in whooping cough, in piemia, in diptheria, in thrush, in yellow fever, in scarlatina, in typhus fever, in vaccine virus, and in small pox. And finally, Lostifer has produced no trifling ebullition in the Vienna Medical Society by the announcement of the discovery of syphilitic corpuscles. Dr. Sanderson, under the patronage of the *privy council* of England, claims to have progressed sufficiently in his researches to be able to distinguish by physical characteristics alone, several kinds of these contagious poisons. He has described them as "aggregations of solid particles, separate, spheroidal, transparent, gelatinous," etc. In short he concludes that infection of the several kinds consists of living organisms, either animal or vegetable, each possessing uniform and constant characteristics. When the nature of each of these shall have been fully discovered, together with the most efficient means for their destruction, it is more than probable that the rational treatment of these large classes of diseases will be established.

The advancement made in PHYSIOLOGY, within a score of years has not been surpassed by any other branch of natural science. The discovery of the double life of man and other animals, each possessed of a

distinct though not entirely independent center of force; the one thinking, feeling, moving, the other receiving, digesting, elaborating and assimilating supplies to wasting tissues, as announced in Bichatt's celebrated essay was not more important than was the discovery of the double function of the spinal nerves, by Sir Charles Bell, or the discovery of the reflex and independent action of the spinal cord, by Marshall Hall. The discovery of the function of the censoria ganglia, at the base of the brain, by Carpenter, was supplemented by Lacock in ascertaining the unconscious action of the cerebrum, and by Dalton in determining the true office of the cerebellum. The recent experiments of Brown Sequard, reveal something of the true nature of diabetes and of epilepsy, and show how these diseases may be produced in healthy subjects. The spinal paralysis of childhood has been found by Parrott and Charcott, to depend upon changes in the anterior lateral columns and anterior roots of spinal nerves, and the law laid down by Sir Charles Bell, that disease action is manifested at the point where all affected fibers are in anatomical contact, has been brought into requistion in determining real from apparent perepheral lesion. Some erroneous notions of the office of the pneumogastrics have been recently dissipated, and the true function of the filaments from these nerves to the coats of the intestines have been more than conjectured. The power of co-ordination, and of articulate language, has been pretty definitely located in the island of Reil and walls of the fissure of Sylvius, and additional light has been thrown upon the pathology of epilepsy, by changes found in the cornu of Amnon. The property of contractility in muscular tissue, has been found by Longet and Sequard, to depend upon the supply of blood, and this fact has been made available in facilitating the reduction of fractures and dislocations, by the compression of the artery of supply. It remained until recently (1862) for Flint, Jr. to discover that the blood returning from the brain in the jugular vein, contained twenty-five per cent more cholesterine than blood circulating in the carotid artery, and that comparative analysis of blood in the hepatic artery and portal vein, shows that this substance is absorbed or extracted in its passage through the liver. This, in short, is the history of the discovery of the fact that cholesterine is the residue of broken down brain and nerve tissue, separated by the liver, to be again discharged, re-converted and re-absorbed by the blood, and appropriated in physiological processes. Bernard's discovery of the elements of sugar in the liver, in 1849, gave a new impulse to scientific inquiry, and prepared the way for a line of brilliant discoveries extending down even to the present time. The comparative analysis of the portal and hepatic venous blood, has clearly established the fact that an amyloid substance is produced in the liver, which by fermentative change is convertible into glycose. He also ascertained that the fourth ventricle of the brain is in some way concerned in this glycogenic function, through the medium of the phrenic nerve and sympathetic system. The glycogenic function he

has found to prevail throughout the animal world, even in the invertebrate and in the living bird's egg, and that neither starch nor cane sugar, as such, is appropriated by the animal economy, but that the elements in both of these are stored up in the form of glycogen, to be converted into glycose, in which form it is assimilated as occasion requires. Following, has been the elaborate series of verifying experiments by Cyon, Aladoff, Eckhardt, and Pava, resulting also in the discovery that the sugar element is increased in the body: first, by injury of the fourth ventricle; second, by injury of the cervical ganglia, and finally by paralysis of the fibers of the cervical and first dorsal branches of the spinal nerves, which in their course from one ganglion to another invest the subclavian artery, forming the annulus of vieussens. Cyon found that irritation of these fibers resulted in contraction of the hepatic artery. that the vasso motor nerves of the hepatic artery are contained in the annulus, and further verifying Bernard's theory that the excessive production of the sugar element, as in diabetes, is ultimately occasioned by increased circulatory motion through the hepatic artery and liver. It is maintained that the inspired air irritates the extremities of the vagi in the lungs and through the medium of the M. Oblongata, an inhibitory action is exerted on the vasso motor nerves of the liver.

The improved methods of observation which have established sharp lines in DIAGNOSIS, are among the characteristic features of modern medicine. The artificial aids supplied by ingenuity and by the extension of principles which pertain more especially to other branches of scientific inquiry, have brought within the range of satisfactory observation nearly every organ and tissue of the living human body. The stethoscope devised by Lenoch inaugurated a new era in the study of the peculiar language of nature, both in health and disease, so that all of the delicate sounds in the operation of the complicated machinery of the animal economy are readily interpreted. By these sounds alone the modern physician pretty accurately determines the condition of the lungs, the pleura, the large blood vessels, and of the heart. The progress made in organic chemistry within a recent period has given almost as wide a range of usefulness to the test tube. The Ophthalmoscope, invented by Helmholtz, the Laryngoscope, invented by Desermaux, the Ottoscope and other instruments of this class are all modern and indispensable aids in diagnosis. In this connection may be mentioned the Splanchnoscope, anticipated by Priestly, but first made available by Dr. Millott, before the academy of sciences in London. The electric light divested of heat, was employed within the stomach by means of the Gesler tube, and satisfactory observations made of the heart, lungs and pleura. Dr. Richardson has also rendered the internal organs of the human body visible by the employment of lime, magnesean and oxyhydrogen lights without the body. The Thermometer, but recently employed for diagnostic purposes, bids fair to become a most valuable aid in diagnosis. The Microscope

in the mere matter of diagnosis is now considered indispensable in the office of every physician. Deposits of lithic acid, of uric acid, of cholesterine, and of earthy salts generally are all distinguished by the forms of their respective crystals. To the use of the microscope is due the discovery of the primary lesion in Bright's disease, which was formerly invariably fatal. Now that the characteristic casts point with unerring certainty to the real condition of the uriniferous tubuli, the disease may be recognized sufficiently early to institute a rational and in many instances a successful treatment. Equally certain and satisfactory are the revelations of the microscope in diagnosing pneumonia by the pneumonic cell, tuberculoses by the tubercular cell, sarcoma by the cancer cell, and in drawing sharp lines in diagnosis between morbid growths of a malignant and non-malignant character. But far beyond the power of the microscope and of ordinary chemical analysis, the *spectrum analysis*, is now used to detect the presence of substances almost inconceivably minute and attenuated. To Mr. Sorby is due the credit of bringing to some degree of perfection this method of analysis, and to Hoppe and Stokes the discovery that the coloring matter of blood is capable of existing in two distinct states of oxydation, each designated by the number of spectral bands, by which venous may be distinguished from arterial blood, however minute or attenuated the specimen.

A better comprehension of the laws which regulate the conservation of vital force in disease, has done away with the practice of profuse *medication*, upon which all expectation of recovery was formerly based, and to which was attributed the occurrence of every favorable symptom. It is now generally conceded that it is equally as important, and equally as difficult, to determine when to medicate, when nature requires assistance, as it is to determine how to medicate, how to meet the therapeutical indications with rational agencies. For it is known that the general tendency in the natural course of many diseases is to recovery — that they are "self limited," that the "*vis medicatrix naturæ*," independent of all artificial assistance, is in many instances capable of accomplishing the most complete and satisfactory cures. But who so well as the intelligent physician can determine the extent of her powers, or anticipate her needed assistance? From the shoals and reefs along the drifting course of disease, it is he that must direct, in all the exigencies of intensity or complication. To do this requires a careful observation of all modifying circumstances and influences. The location, state of the atmosphere, season of the year, age, sex, temperament, predisposition, and idiosyncrasy, are all carefully considered, not only in their relation to disease, but to their modifying influences upon remedies. The value of a proper diet and of a pure air for the sick, has not been until recently fully recognized. The conditions that preserve health are known to be among the best means of restoring it, and in many diseases proper hygienic observances are not even secondary in importance to the most judicious medication.

Not only are fewer prescriptions used than formerly, but they are, as a rule, more simple. Instead of the long lists of incongruous and often incompatible articles formerly combined in a single prescription, the more prominent indications are now met by one or two only of the most reliable articles or therapeutical agencies.

Chemistry, and Pharmacy, have rendered valuable service in the isolation of the active principles of every crude medicinal substance, so that instead of the bulky and revolting doses necessary to produce a specific effect, we now have those beautiful and palatable preparations — the alkaloids, extracts, syrups, elixirs, etc., containing the very essence of therapeutical force. The comfort and convenience of patients have also been regarded. In many instances the substance is entirely encased, and in others entirely divested of all disagreeable taste and smell, so as to be acceptable even to the most fastidious sensibilities. In this connection may be mentioned, also, the so-called "divided medicines," which afford the physician at all times known quantities in convenient form. With improvements in medicinal preparations has increased also our knowledge of therapeutical action. The excessive use of alteratives by the regular profession on the one hand, and the endless variety of "liver medicines" with which quacks have flooded the country, on the other, are somewhat indicative of the extent to which therapeutical, as well as pathological error, has been popularized. No word, perhaps, in the medical vocabulary, has been more universally employed than the word "bilious." Wherever the ailment might have been located, or whatever its nature, this term has been used as a satisfactory explanation of the pathological condition. But many of the ailments formerly attributed to derangements of the liver have been found to depend upon primary lesion somewhere else, the condition of the liver being merely sympathetic or secondary thereto. The green fœcal discharges following the use of mercury, instead of being bile, as was formerly supposed, have been found to really contain no bile at all, their characteristic color being attributed to the presence of disorganized heamatine; and it is now considered doubtful if mercury exerts any direct or primary influence at all in the secretion of bile. Many new and valuable articles have been added to the list of the *materia medica*. It is true that the specific powers of many of these articles have not been definitely determined, but no one doubts the power of opium, in therapeutical doses, to relieve pain; nor the utility of iron in chlorosis, or cinchonia in intermittents; nor of iodine in goiter; nor that digitalis will reduce the action of the heart, nor that alcohol will increase it; nor that ipecac will produce emesis; nor that colchicum will cure gout. We know that chloral hydrate will produce sleep; that carbolic acid will prevent suppuration and promote granulation; that ozone will destroy infection; that vaccination will prevent small pox; that belladonna will dilate the pupil, and that Calaba bean will contract it, etc., etc. So that there is much in therapeutics reduced already to mathematical cer-

tainty. The discovery of chloroform (by an American), by which many of the terrors of operative surgery have been abolished, is a priceless boon to humanity. But the subject of so many beautiful enconiums, all over the world, now has rivals in nitrous oxyde gas, and in the bi chloride of methylene, both of which have been discovered within a comparatively recent period.

Among the improvements in Modern Surgery, there is much that relates to the operative procedures upon the eye. The urethral dilation with median incision in lithotomy; and a very great number of ingenious procedures in plastic surgery, as performed by Drs. Buck, Sayre, and Marcoe, are all modern. Closely allied to this subject is the process of skin grafting, as recently practiced by Drs. Tellaux and Mussat, and also the substitution of torsion for ligation in the closure of large vessels. It may not be deemed altogether inexcusable on an occasion like this to make brief allusion to the part our country shares in the present advanced state of the science and art of operative surgery, nor to the fact that at the world's fair in 1866, the highest premiums were awarded, with a few exceptions, to American manufacturers, for the superior quality, finish and adaptability of their surgical instruments. We lay claim to a Mott, the first to ligate successfully the primitive illiac; and to a Mussey, the first to ligate both primitive carotids. Alden Marsh, too, was the first to discover the true nature of coxalgia, and to advocate extension in the treatment of inflamed joints. American surgery claims also a McDowell, the first successful ovariotomist; a Sims, the first to institute rational treatment for the cure of vesico vaginal fistula; a Priestly, who removed both ovaries; a Rodgers, who first ligated the internal illiac; a Caronochan, who first removed the entire lower jaw; and a Warren, who first removed an entire upper jaw. But it is not in civil surgery alone that Americans have excelled. The statistical reports of operative surgery during the late civil war may safely challenge comparison with any in the history of the world. How many useful hands, and feet, and limbs, and lives also, are the proud trophies to-day of conservative American surgery. And who will estimate the true value of a limb, or of a human life.

Within hailing distance of this hall, is the office of the Superintendent of the Iowa division of a railroad. Upon the chart of his perception are clearly delineated all the curves and cuts, the grades and the trussel structure of the whole line, from the Mississippi to the Missouri. A dozen trains of heavily laden cargoes of commerce and human life are at all hours thundering to and fro, meeting, passing and repassing, arriving and departing at preappointed times and places, with a regularity scarcely less precise than are the movements of a chronometer. Thus, under the supervision of one man, do the thousands of agencies employed harmonize and work together, each man, engine, car, steam and brake performing with alacrity and certainty, the one duty assigned, for the one ultimate and grand purpose,

that of facilitating travel and commercial intercourse. So the physician, with a thorough knowledge of the great highway of human life, the predispositions of youth, middle life and old age, with an accurate knowledge of the thousands of subtle forces which operate the intricate machinery of the human body, and with the means in hand for accelerating, retarding or modifying all these, is enabled to conduct with safety through the perils and dangers of disease, thousands of the precious lives committed to his care. His ten, twenty, or fifty daily patients, may be so many illustrations of the skill and ingenuity of man in modifying and thwarting forces which antagonize and destroy the living. But the crowning proof of progress in medicine and surgery is found in the lengthened period of human life. Less than two centuries ago, of every one hundred children born in the city of London, seventy-five died under five years of age. Now, less than one-half die under five years. In France, in 1700, the mortality of the whole population was one in twenty-five. Now it is one in forty-five. The mean duration of life then was twenty-eight and one-half years. Now it is thirty-three and six-tenths years. M. C. Dupen, in a paper on the vital statistics of France, has shown that the average period of human life has been lengthened fifty-two days annually or nine and one-half years in sixty-seven. In England, France and Germany, the average human life was thirty years. Now it is more than thirty-eight years, and the number of deaths annually, less by seven hundred thousand. Dr. Simpson, in his paper on statistics in surgery, shows a reduction of twenty-eight per cent in the death rate of England and Wales in half a century. A similar exhibit is made by Marshall Hall, on bills of mortality. Milene, in the Carlisle life tables, shows a reduction of twenty-two per cent. In the fifty years ending in 1850, the average mortality in New York hospital was thirty per cent less than in the fifty years preceding. There has been a corresponding decrease in the death rate in nearly all the charitable institutions in this country. More than two hundred thousand lives all over the world are saved every year by one discovery alone — the protective power of vaccination. In England there were, before the introduction of vaccination, thirty thousand deaths annually from small pox. Then, too, the population was but one-third of what it now is.

These meager illustrations from a few departments indicate something of the present attitude of medical science, and the direction of its progressive tendencies. But medical students are not elated, make no ostentatious pretensions. They labor on quietly, and often without pecuniary reward, in the line of duty, for they know that however great the advancement that has already been attained to is, and however manifold the blessings conferred upon the human kind are, that there is still beyond a vast ocean of truth, which is yet to be discovered, and its benefits made available to prolong human life and to lessen human misery. Tyndall has shown that but one-third of the light from the solar beams is employed by human eyes for visual purposes.

So but a small part of the light of truth which everywhere surrounds us and which looms up before us at every step of progress, has been perceived by human intelligence. But the laborers are in the field and their march is upward and onward. In every part of the world are stationed careful and watchful observers, with all modern aids, whose discoveries give precision and force to the labors of every studious practitioner; and their charts, delineated in the field of the microscope and pencilled by the sunbeams with an accuracy never attained by human hands, lead on, step by step, up the sublime heights of that grand pyramid emblazoned PHILANTHROPY, and embellished with all human art, all human science, all human intelligence and developement, and whose top is lost in the sublimities of that knowledge and perfection which belongs alone to INFINITY.